

Tectonic Deformation of the Southern Coast Ranges and Santa Maria Basin, California

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We have extended our analysis of space geodetic [Feigl et al., 1993] and terrestrial [Dong, 1993] measurements in central and southern California to include additional GPS observations in 1992 & 1994. The additional data reduce by a factor of two the velocity uncertainties for nine key sites in the Ventura and Santa Maria basins and in the southern Coast Ranges and now provide a quite useful combination of space and terrestrial geodetic data. We extended our elastic dislocation modeling [Feigl et al., 1993] by including strike-slip motion at depth on the Hosgri and Big Pine faults, in addition to the previously included San Andreas, San Jacinto, Elsinore, and Garlock faults. Using a grid search that varied the slip rate and locking depth of each fault segment, we were able to account for virtually all of the fault-parallel deformation, simultaneously satisfying both the space geodetic and terrestrial observations. The resulting residual velocities suggest that the Santa Maria basin is shortening by 1 ± 0.5 mm/yr, with most of the deformation accommodated by the Purisima-Solomon thrust. Residual velocities at San Simeon, Morro Bay, and Pt. Sal can be modeled by near-surface slip on the Hosgri fault at a rate of 1-2 mm/yr.